V22 Version

COREMORROW
Piezo Nano Motion

Piezo Nano Motion

- Piezo Tip/Tilt/Z Platform -

Harbin Core Tomorrow Science & Technology Co.,Ltd.

Piezo Tip/Tilt/Z Platform

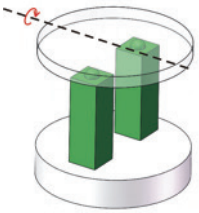
Using piezo actuators as the driving source, Piezo Tip/Tilt Platform can generate θx, θy tilt, or also Z motion, which is used to drive the deflection of the reflective/ transmissive lens to change the direction of the optical path.

Piezo Tip/Tilt/Z Platform

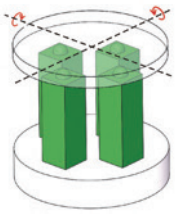
Piezoelectric Tip/tilt/Z Platform uses piezoelectric actuators as driving components, adopts a flexible hinge parallel guiding structure and realizes single-axis or multi-axis angular deflection motion through the expansion and contraction of internal piezoelectric actuators. To ensure the deflection with excellent motion accuracy and high stability, it can also use closed-loop control with built-in high-precision sensor to achieve nano-radian resolution and microradian positioning accuracy.

▸ Different Motion Directions

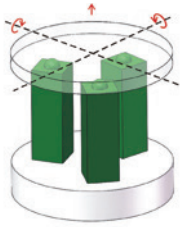
1 axis motion
θx



2 axes motion
θx, θy

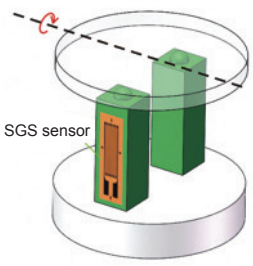


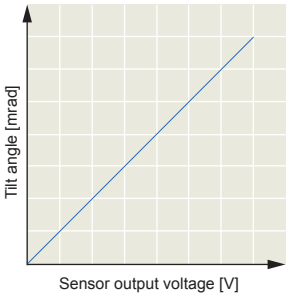
3 axes motion
θx, θy, Z



▸ Closed Loop for High Accuracy

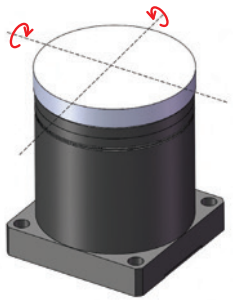
For closed-loop control, the sensor output monitoring voltage is linear with the deflection angle of piezo platform.



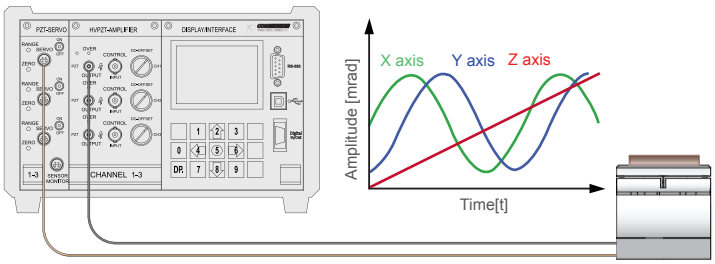


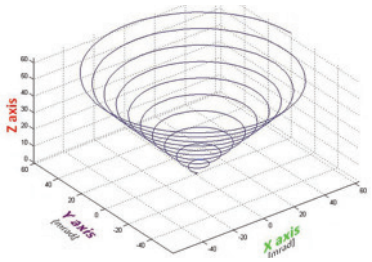
▸ Large Load Capacity

Designed with high rigidity structure, it can carry mirrors with an outer diameter of 110mm. Larger load platforms are customizable.

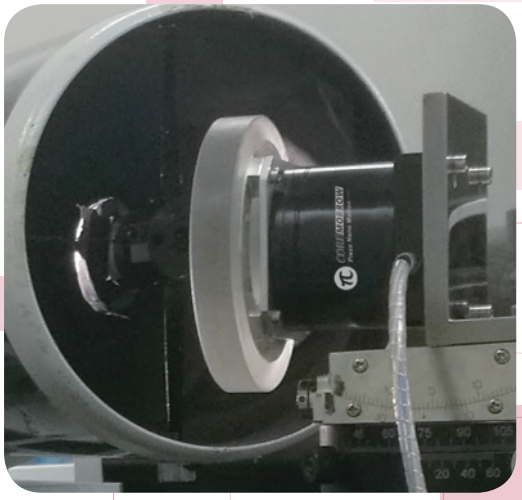


▸ Driving

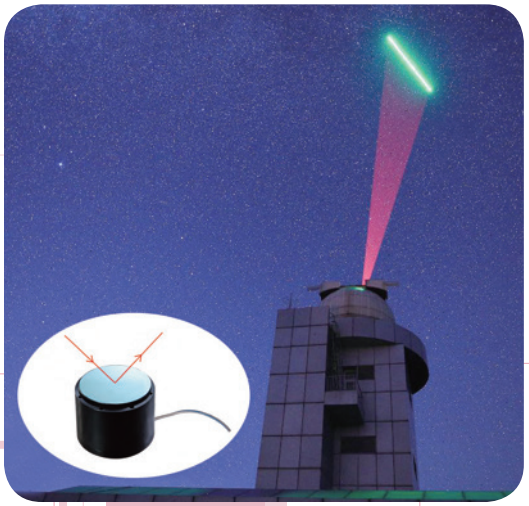




▸ Applications

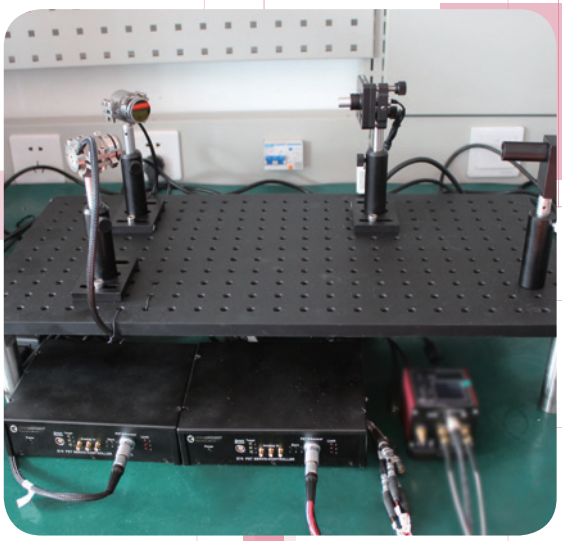


Optical Path Adjustment



Laser Communication

Deformable Mirror



Laser Stabilization

▶ Product List

Type	Axes	Tilt angle	Resolution	Resonant frequency	Page
P32	θx, θy Z	6mrad(≈ 1230″) /axis 37.5μm	0.05μrad(≈ 0.01″) 0.5nm	2kHz	4
P33.T1	θx, θy	1.25mrad(≈ 250″) /axis	0.05μrad(≈ 0.01″)	3.8kHz	6
P33.T2	θx, θy	3mrad(≈ 610″) /axis	0.02μrad(<0.01″)	3.7kHz	6
P33.T3	θx, θy	5mrad(≈ 1000″) /axis	0.05μrad(≈ 0.01″)	3.5kHz	6
P33.T4	θx, θy	6mrad(≈ 1230″) /axis	0.1μrad(≈ 0.02″)	3.4kHz	6
P33.T5	θx, θy	8.5mrad(≈ 1700″) /axis	0.12μrad(≈ 0.02″)	3.3kHz	6
P33.T6	θx, θy	9mrad(≈ 1850″) /axis	0.15μrad(≈ 0.03″)	3.2kHz	6
P33.T8	θx, θy	12.5mrad(≈ 2500″) /axis	0.2μrad(≈ 0.04″)	3.1kHz	6
P33.U2	θx	3mrad(≈ 610″)	0.02μrad(<0.01″)	3.7kHz	6
P33.U3	θx	5mrad(≈ 1000″)	0.05μrad(≈ 0.01″)	3.5kHz	6
P33.U4	θx	6mrad(≈ 1230″)	0.1μrad(≈ 0.02″)	3.4kHz	6
P33.U5	θx	8.5mrad(≈ 1700″)	0.12μrad(≈ 0.02″)	3.3kHz	6
P33.U6	θx	9mrad(≈ 1850″)	0.15μrad(≈ 0.03″)	3.2kHz	6
P33.U8	θx	12.5mrad(≈ 2500″)	0.2μrad(≈ 0.04″)	3.1kHz	6
P34.T1	θx, θy	1.5mrad(≈ 300″) /axis	0.02μrad(<0.01″)	2kHz	9
P34.T2	θx, θy	3mrad(≈ 610″) /axis	0.1μrad(≈ 0.02″)	1.4kHz	9
P34.T4	θx, θy	6mrad(≈ 1230″) /axis	0.2μrad(≈ 0.04″)	0.9kHz	9
P35.T20	θx, θy	27mrad(≈ 5569″) /axis	1μrad(≈ 0.2″)	1.75kHz	11
P35.T40	θx, θy	43mrad(≈ 8869″) /axis	1μrad(≈ 0.2″)	1.5kHz	11
P35A.T40	θx, θy	50mrad(≈ 10300″) /axis	1μrad(≈ 0.2″)	1.3kHz	12
S22	θx	3mrad(≈ 610″)	0.1μrad(≈ 0.02″)	3kHz	13
S23	θx, θy Z	0.7mrad(≈ 140″) /axis 10μm	0.02μrad(<0.01″) 0.1 nm	7.5kHz	14
S30.T1	θx, θy	1.5mrad(≈ 300″) /axis	0.02μrad(<0.01″)	15kHz	16
S30.T2	θx, θy	3mrad(≈ 610″) /axis	0.03μrad(<0.01″)	15kHz	16
S33.T1	θx, θy	1.5mrad(≈ 300″) /axis	0.02μrad(<0.01″)	7kHz	17
S33.T2	θx, θy	3mrad(≈ 610″) /axis	0.04μrad(<0.01″)	2kHz	17
S34.T2S/KF	θx, θy	2.5mrad(≈ 500″) /axis	< 1μrad(<0.2″)	1.7kHz	18
S34.T2S/KY	θx, θy	1mrad(≈ 200″) /axis	0.02μrad(<0.01″)	2.8kHz	19
S37.T2	θx, θy	3.5mrad(≈ 722″) /axis	0.1μrad(≈ 0.02″)	6.5kHz	20
S37.T3	θx, θy	5.5mrad(≈ 1134″) /axis	0.15μrad(≈ 0.03″)	6.4kHz	20
S37.T4	θx, θy	6.8mrad(≈ 1403″) /axis	0.25μrad(≈ 0.05″)	6.3kHz	20
S37.T5	θx, θy	9.5mrad(≈ 1960″) /axis	0.3μrad(≈ 0.06″)	6.2kHz	20
S37.T6	θx, θy	10mrad(≈ 2063″) /axis	0.35μrad(≈ 0.07″)	6.1kHz	20
S37.T8	θx, θy	13.5mrad(≈ 2785″) /axis	0.5μrad(≈ 0.1″)	6kHz	20
Custom platform	θx, θy	±0.25mrad(≈ ±50″) /axis	-	8kHz	21
20072	θx, θy	±4mrad(≈ ±800″) /axis	-	-	22
20193-1	θx, θy	±0.5mrad(≈ ±100″) /axis	-	15kHz	23
20193-2	θx, θy	±1.2mrad(≈ ±247″) /axis	-	10kHz	23
21019	θx, θy Z	17mrad(≈ ±3506″) /axis 200μm	-	1kHz	23
Laser stabilization system					24

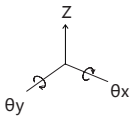
P32 Piezo Tip/Tilt and Z Platform

P32 Piezo Tip/Tilt and Z Platform provides high-speed precision θx,θy tilt and Z linear motion. The resolution of linear motion can reach sub-nanometer level, deflection resolution reaches submicroradians, and response time can reach milliseconds. P32 piezoelectric deflection mirrors are compact, enabling up to 6mrad deflection and 37.5μm Z-axis linear motion.

▸ Characteristics

- θx, θy and Z motion
- Tilt angle to 6mrad
- Sub-ms response time
- High closed loop positioning accuracy

▸ θx, θy and Z axis Motions



▸ High Resolution, Stability and Dynamics

P32 piezo tip/tilt and Z platform is compact and internally assembled with a pre-load, high-reliability piezo actuator integrated into a complex, flexible hinge guidance system that is modeled and analyzed by FEA.

P32 uses a parallel-kinetic direct-drive tripod structure that provides optimum angular stability over a wide temperature range. This design has the advantages of small size, high dynamic performance, fast response and high linearity, making it ideal for industrial applications.

▸ Applications

- Image processing and stabilization
- Optical capture
- Laser scanning and beam deflection
- Laser tuning
- Light filter/optical switch
- Optics/beam stabilization

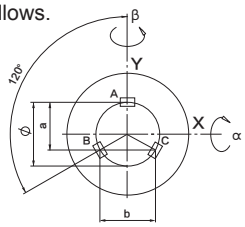
▸ Driving Principle

P32 piezo tip/tilt and Z platform is designed based on the mechanism drived by three piezo actuators that are placed at an angle intervals of 120°. In addition to tilting motion, this structural design also enables linear movement of the Z-direction, which can be used to correct the optical path length. In below drawing, A, B, C represent the measured displacement at the points, and the simple calculation formulas of the two-axis tilt angle and Z-direction displacement are as follows.

$$\alpha = [A-(B+C)/2]/a$$

$$\beta = (B-C)/b$$

$$Z = (A+B+C)/3$$



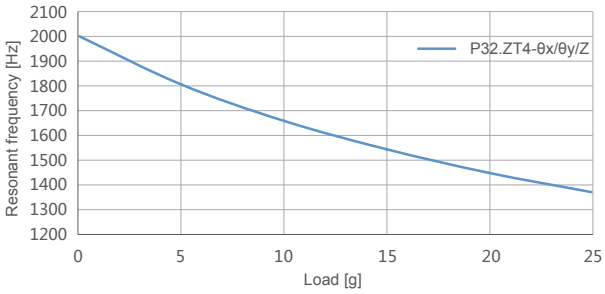
$$a = \frac{b}{2}\sqrt{3}\ ,\quad \varnothing = \frac{2b}{3}\sqrt{3}$$

▸ Custom Integrated Deflection System

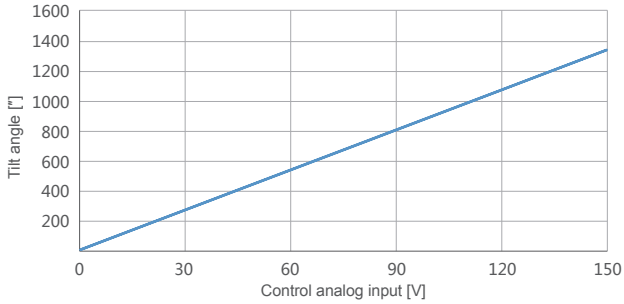
▸ Recommended Controllers

E01	E00	E70
		
3 channels Digital, analog Open/closed loop Ave. current to 291mA	3 channels Digital, analog Open/closed loop Ave. current to 291mA	3 channels Digital, analog Open/closed loop Ave. current to 70mA
Note: Please see "Piezo Controller" for detailed information.		

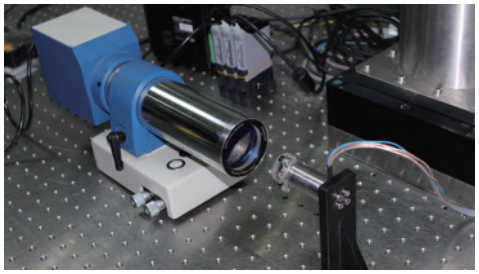
Frequency and Load Curve



Closed-Loop Curve

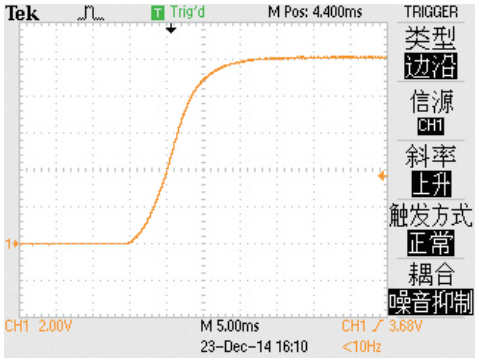


Measuring Tilt Angle



Step Time

The step time of the P32.ZT4S piezo platform reaching the full stroke after loading is about 15ms.



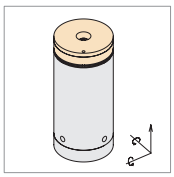
Technical Data

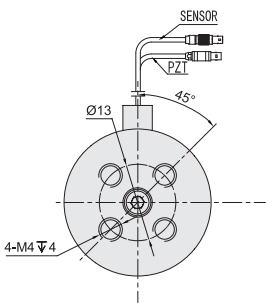
Type	S - closed loop K - open loop	P32.ZT4S P32.ZT4K	Units
Active axes		θx, θy, Z	
θx, θy Tilt angle(0~120V)		5(≈1030″)	mrad±10%
Travel in Z(0~120V)		30	μm±10%
θx, θy tilt angle(0~150V)		6(≈1230″)	mrad±10%
Travel in Z(0~150V)		37.5	μm±10%
Integrated sensor		SGS/-	
Resolution in θx, θy		0.1(≈0.02″)/0.05(≈0.01″)	μrad
Resolution in Z		1/0.5	nm
Closed-loop linearity		0.05/-	%F.S.
Closed-loop repeatability		0.02/-	%F.S.
Unloaded resonant frequency		2	kHz±20%
Unloaded step time		5/2	ms±20%
Unloaded operating frequency	10% travel	500	Hz±20%
	100% travel	40	
El. capacitance		3.6/axis	μF±20%
Material		Steel	
Mass		350	g±5%

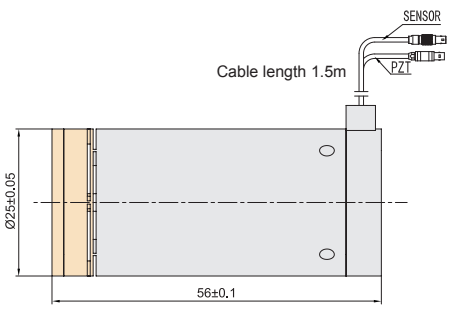
Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

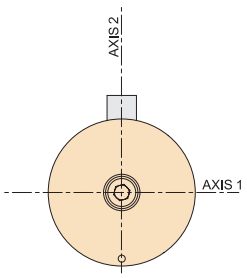
Drawing

P32









P33 Piezo Tip/Tilt Platform

P33 Piezo Tip/Tilt Platform is a deflection platform with fast response and compact size. It provides high-precision angular motion of the top platform. Compared with other actuators, the flexible hinge-guided piezoelectric deflection platform provides higher acceleration.

▸ Two Mounting Ways

Bottom fixed

θx、θy tilt

Waist fixed

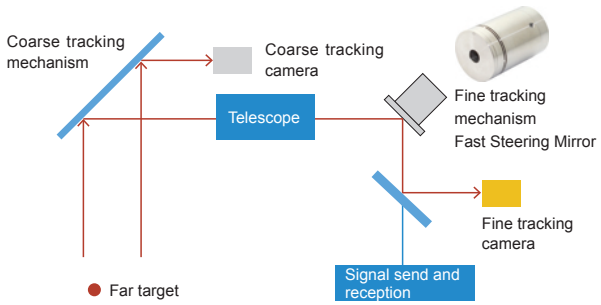
▸ Characteristics

- θx or θx, θy tilt
- Tilt range to 12.5mrad
- Sub-ms response time
- High closed-loop positioning accuracy
- High temperature stability
- Custom UHV, etc. is available

▸ Closed-Loop for High Accuracy

Closed-Loop sensors provide high accuray and feedback position signals to the controller. The sensors are connected in a bridge configuration to eliminate thermal drift and ensure high, stability.

This platform can take Ø25.4mm standard diameter lens, and custom is available for Ø50mm mirror.

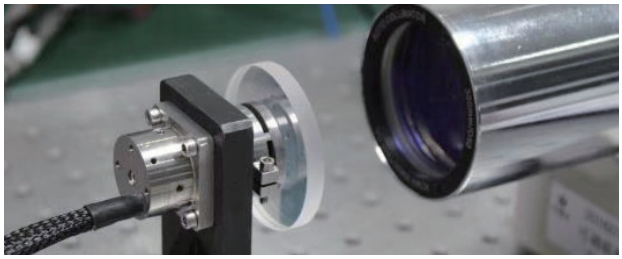


▸ Applications

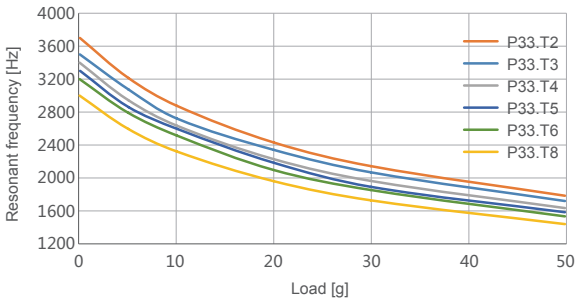
- Image processing and stabilization
- Interlaced scanning, jitter
- Laser micromachining
- Adaptive optics, image stabilization
- Laser scanning
- Optical filter/switch
- Beam deflection
- Interference

▸ Measuring Tilt Angle

Laser collimator is measuring the deflection angle of P33.T2S piezo platform.



▸ Frequency and Load Curve



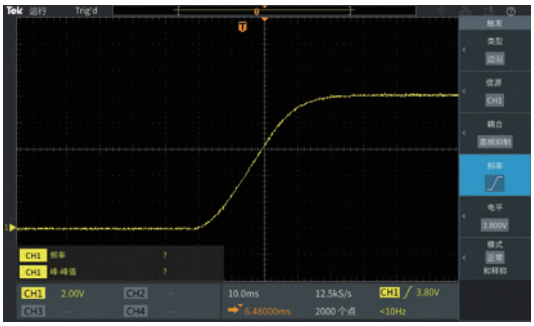
▸ Recommended Controllers

E00/E01	E70	E81-D
		
3 channels with 1 constant voltage Digital, analog Ave. current to 291mA	3 channels with 1 constant voltage Digital, analog Ave. current to 70mA	3 channels with 1 constant voltage Analog control Ave. current to 50mA

Note: Please see "Piezo Controller" for detailed information.

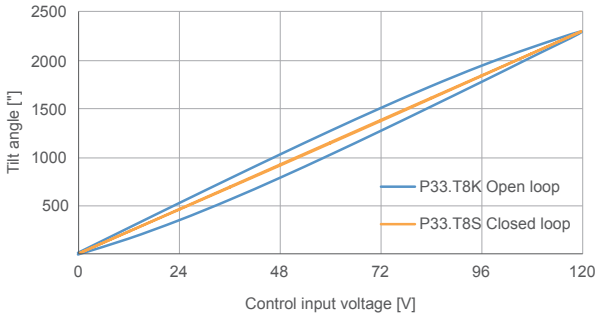
Loaded Step Time

P33.T8S step time is ~40ms with a loading 50g up to 100% stroke.



Open/Closed-Loop Curve

P33.T8K VS P33.T8S



※Selection Guide

P33. T 2 S Y

Active axis
- T θxθy
- U θx

Tilt Angle
- 1 1mrad
- 2 2.5mrad
- 3 4mrad
- 4 5mrad
- 5 6.8mrad
- 6 7.5mrad
- 8 10mrad

Sensor
- S with sensor
- K no sensor

Fix way (Refer to "Drawing")
- F Waist fix for square
- Y Bottom fix for round

E.g.: P33.T2S F, θxθy tilt motion, tilt angle to 2.5mrad, with sensor, mounting location in waist.

Technical Data(θx, θy)

Type	P33.T1SF/Y P33.T1KF/Y	P33.T2SF/Y P33.T2KF/Y	P33.T3SF/Y P33.T3KF/Y	P33.T4SF/Y P33.T4KF/Y	P33.T5SF/Y P33.T5KF/Y	P33.T6SF/Y P33.T6KF/Y	P33.T8SF/Y P33.T8KF/Y	Units
Active axes	θx, θy	θx, θy	θx, θy	θx, θy	θx, θy	θ, θy	θx, θy	
Tilt angle (0~120V)	1(≈200″) /±0.5(≈±100″)	2.5(≈500″) /±1.25(≈±250″)	4(≈820″) /±2(≈±410″)	5(≈1000″) /±2.5(≈±500″)	6.8(≈1400″) /±3.4(≈±700″)	7.5(≈1500″) /±3.75(≈±750″)	10(≈2060″) /±5(≈±1030″)	mrad±10%
Tilt angle (0~150V)	1.25(≈250″) /±0.625 (≈±125″)	3(≈610″) /±1.5(≈±300″)	5(≈1000″) /±2.5(≈±500″)	6(≈1230″) /±3(≈±600″)	8.5(≈1700″) /±4.25(≈±850″)	9(≈1850″) /±4.5(≈±950″)	12.5(≈2500″) /±6.25(≈±1250″)	mrad±10%
Integrated sensor	SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	
Resolution	0.1(≈0.02″) /0.05(≈0.01″)	0.05(≈0.01″) /0.02(<0.01″)	0.15(≈0.03″) /0.05(≈0.01″)	0.25(≈0.05″) /0.1(≈0.02″)	0.35(≈0.07″) /0.12(≈0.02″)	0.45(≈0.09″) /0.15(≈0.03″)	0.5(≈0.1″) /0.2(≈0.04″)	μrad
Closed-loop linearity	-	0.1/-	0.15/-	0.2/-	0.25/-	0.25/-	0.25/-	%F.S.
Closed-loop repeatability	-	0.02/-	0.02/-	0.02/-	0.02/-	0.02/-	0.02/-	%F.S.
Unloaded resonant frequency	3.8	3.7	3.5	3.4	3.3	3.2	3.1	kHz±20%
Unloaded step time	-	1.5/1	2.5/1.5	3/2	5/2.5	6/3.5	8/4	ms±20%
Unloaded operating frequency 10% travel	1100	1000	650	500	400	300	150	Hz±20%
Unloaded operating frequency 100% travel	90	80	60	40	30	25	15	Hz±20%
El. capacitance	1.8/axis	3.6/axis	5.2/axis	7.2/axis	9/axis	11/axis	14.5/axis	μF±20%
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	
Mass	150	190	220	240	265	290	340	g±5%
Platform Length L	28	37	46	55	64	73	91	mm

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

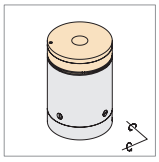
▸ Technical Data(θx)

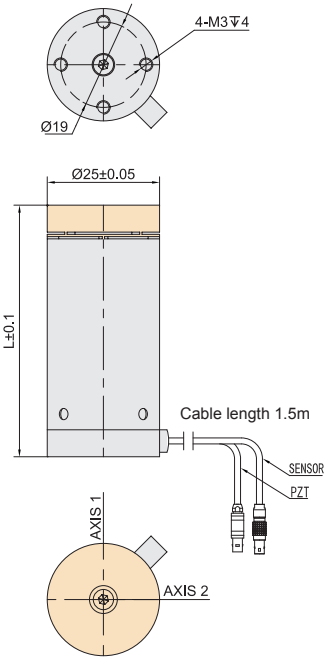
Type		P33.U2SF/Y P33.U2KF/Y	P33.U3SF/Y P33.U3KF/Y	P33.U4SF/Y P33.U4KF/Y	P33.U5SF/Y P33.U5KF/Y	P33.U6SF/Y P33.U6KF/Y	P33.U8SF/Y P33.U8KF/Y	Units
Active axes		θx	θx	θx	θx	θx	θx	
Tilt angle(0~120V)		2.5(≈500″) /±1.25(≈±250″)	4(≈820″) /±2(≈±410″)	5(≈1000″) /±2.5(≈±500″)	6.8(≈1400″) /±3.4(≈±700″)	7.5(≈1500″) /±3.75(≈±750″)	10(≈2060″) /±5(≈±1030″)	mrad±10%
Tilt angle(0~150V)		3(≈610″) /±1.5(≈±300″)	5(≈1000″) /±2.5(≈±500″)	6(≈1230″) /±3(≈±600″)	8.5(≈1700″) /±4.25(≈±850″)	9(≈1850″) /±4.5(≈±950″)	12.5(≈2500″) /±6.25(≈±1250″)	mrad±10%
Integrated sensor		SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	
Resolution		0.05(≈0.01″) /0.02(<0.01″)	0.15(≈0.03″) /0.05(≈0.01″)	0.25(≈0.05″) /0.1(≈0.02″)	0.35(≈0.07″) /0.12(≈0.02″)	0.45(≈0.09″) /0.15(≈0.03″)	0.5(≈0.1″) /0.2(≈0.04″)	μrad
Closed-loop linearity		0.1/-	0.15/-	0.2/-	0.25/-	0.25/-	0.25/-	%F.S.
Closed-loop repeatability		0.02/-	0.02/-	0.02/-	0.02/-	0.02/-	0.02/-	%F.S.
Unloaded resonant frequency		3.7	3.5	3.4	3.3	3.2	3.1	kHz±20%
Unloaded step time		1.5/1	2.5/1.5	3/2	5/2.5	6/3.5	8/4	ms±20%
Unloaded operating frequency	10% travel	1000	800	500	400	300	150	Hz±20%
	100% travel	80	60	40	30	25	15	
El. capacitance		3.6	5.2	7.2	9	11	14.5	μF±20%
Material		Steel	Steel	Steel	Steel	Steel	Steel	
Mass		190	220	240	265	290	340	g±5%
Platform length L		37	46	55	64	73	91	mm±0.1

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

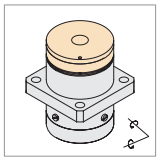
▸ Drawings

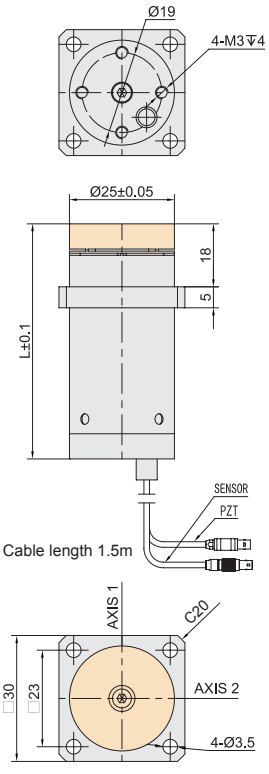
P33.xxxY





P33.xxxF





P34 Piezo Tip/Tilt Platform

P34 piezoelectric deflection platform is designed for large up to 80 mm in diameter. Their differential drive exhibits excellent angular positioning stability over a wide temperature range. P34's structure allows the top platform to perform high dynamic precision deflection motion on two orthogonal axes with common pivot points.

Characteristics

• θx, θy tilt • Tilt range to 6mrad • Sub-ms response • High closed-loop positioning accuracy • High temperature stability

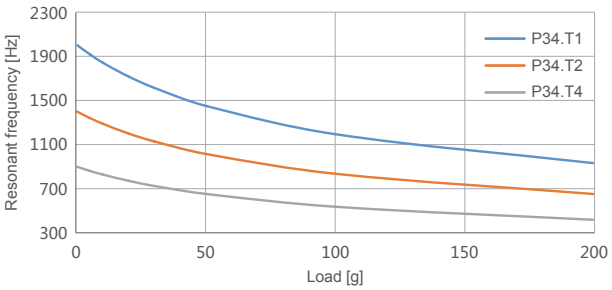
Applications

• Image processing and stabilization
• Optical filter
• Laser scanning/beam deflection
• Active and adaptive optic
• Beam stabilization
• Error correction for polygon mirror

High Stability, Long Lifetime

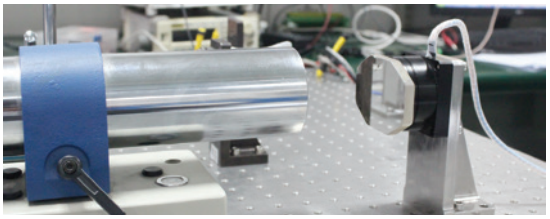
CoreMororow's piezo tip/tilt system is based on a parallel kinematic design. The internal four piezo actuators are paired differential controls that determine the platform deflection motion, which makes P34 piezo platform have excellent angular positioning stability in a wide temperature range. Internal piezo actuator ensures maximum reliability. Special resin insulation makes it resistant to environmental humidity and leakage current faults.

Frequency and Load Curve



Large Load Capacity

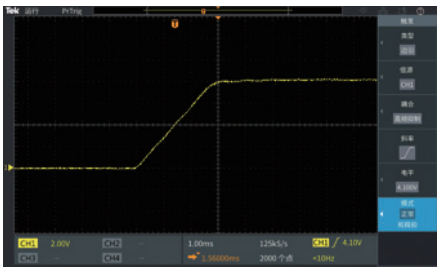
P34 piezo tip/tilt platform can support lens up to 80mm in diameter for beam deflection of 12mrad.

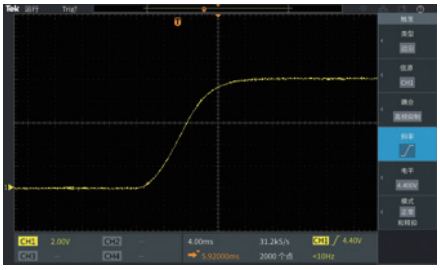


* Custom size, load capacity, etc. are available.

Step Time

Controlled by E51.B piezo controller, P34.T2S piezo tip/tilt platform's step time to 80% deflection range is about 3ms; The step time of loading 200g to 100% tilt range is about 15ms.





Recommended Controllers

E00	E70	E53.B
		
3 channels with 1 constant voltage Digital, analog Open/closed loop Ave. current to 291mA	3 channels with 1 constant voltage Digital, analog Open/closed loop Ave. current to 70mA	3 channels with 1 constant voltage Digital, analog I Open/closed loop Ave. current to 60mA

Note: Please see "Piezo Controller" for detailed information.

▸ ※Selection Guide

P34. T 1 S

Active axis
- T θxθy
- U θx

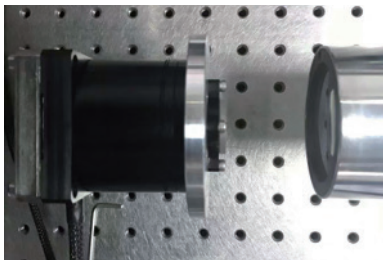
Tilt Angle
- 1 1.2mrad
- 2 2.5mrad
- 4 5mrad

Sensor
- S with sensor
- K no sensor

E.g.: P34.T2S, θxθy tilt motion, tilt angle to 2.5 mrad , with sensor.

▸ Measuring Tilt Angle

The deflection angle range of P34.T2S is measured by a laser collimator.



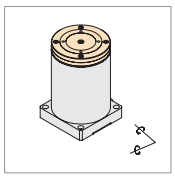
▸ Technical Data

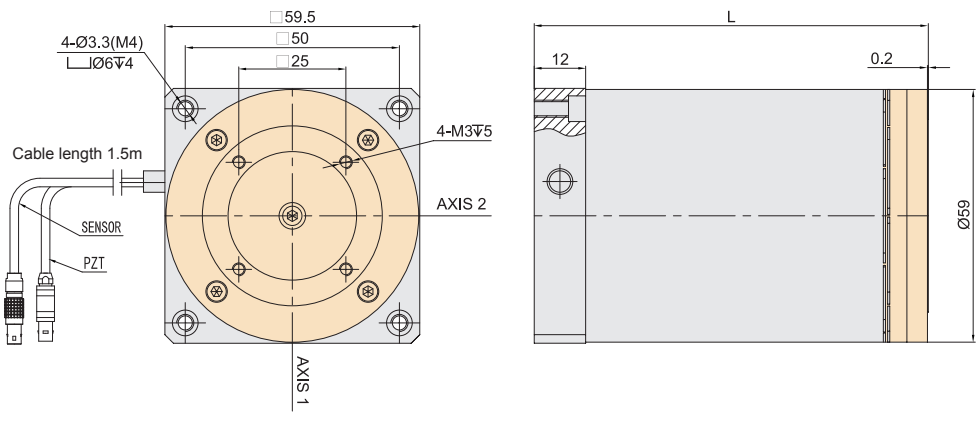
Type	S - closed loop K - open loop	P34.T1S P34.T1K	P34.T2S P34.T2K	P34.T4S P34.T4K	Units
Active axes		θx, θy	θx, θy	θx, θy	
Tilt angle(0~120V)		1.2(≈240″)/±0.6(≈120″)	2.5(≈510″)/±1.25(≈±255″)	5(≈1030″)/±2.5(≈±515″)	mrad±10%
Tilt angle(0~150V)		1.5(≈300″)/±0.75(≈±150″)	3(≈610″)/±1.5(≈±305″)	6(≈1230″)/±3(≈±615″)	mrad±10%
Integrated sensor		SGS/-	SGS/-	SGS/-	
Resolution		0.1(≈0.02″)/0.02(<0.01″)	0.2(≈0.04″)/0.1(≈0.02″)	0.4(≈0.08″)/0.2(≈0.04″)	μrad
Closed-loop linearity		0.1/-	0.2/-	0.3/-	%F.S.
Closed-loop repeatability		0.02/-	0.02/-	0.02/-	%F.S.
Unloaded resonant frequency		2	1.4	0.9	kHz±20%
Unloaded step time		2/1	4/2	10/4	ms±20%
Unloaded operating frequency	10% travel	1000	500	240	Hz±20%
	100% travel	100	50	20	
El. capacitance		3.6/axis	7.2/axis	14.5/axis	μF±20%
Material		Aluminum	Aluminum	Aluminum	
Mass		200	400	800	g±5%
Platform length L		38	56	92	mm±0.1

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

▸ Drawing

P34





P35 Piezo Tip/Tilt Platform

Designed for high large-angle deflection applications, P35 Piezo Tip/Tilt Platforms provide beam deflections up to 86mrad (approximately 4.9 degrees, 17700"), making them ideal for fast deflection applications with high precision and large angle.

▸ Characteristics

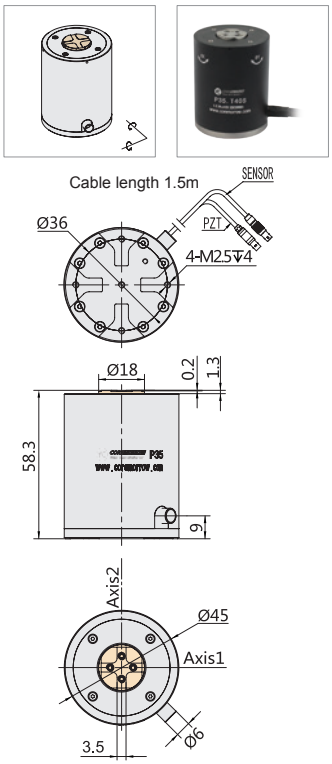
- θx, θy tilt
- Tilt angle to 43mrad/axis
- Resolution to 1μrad
- Unloaded resonant frequency to 1.75kHz

▸ Technical Data

Type	S - closed loop K - open loop	P35.T20S P35.T20K	P35.T40S P35.T40K	Units
Active axes		θx, θy	θx, θy	
Tilt angle(0~120V)		22/±11(≈±2268″)	35/±17.5(≈±3600″)	mrad±10%
Tilt angle(0~150V)		27/±13.5(≈±2784″)	43/±21.5(≈±4400″)	mrad±10%
Integrated sensor		SGS/-	SGS/-	
Resolution		4/1(≈0.8″/0.2″)	4/1(≈0.8″/0.2″)	μrad
Closed-loop linearity		0.08/-	0.02/-	%F.S.
Closed-loop repeatability		0.04/-	0.014/-	%F.S.
Unloaded resonant frequency		1750	1500	Hz±20%
Resonant frequency		800(@25.4×4mm)	480(@10.6g) 215(@30g)	Hz±20%
Closed/open-loop step time@10.6g		-	10/1.2	ms±20%
Closed-loop step time@30g		-	25	ms±20%
El. capacitance		7.2/axis	7.2/axis	μF±20%
Material		Titanium, aluminum	Titanium, aluminum	
Mass		260	335	g±5%

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

▸ Drawing



▸ ※Selection g Guide

P35. T 40 S

Active axis
- T θxθy
- U θx

Tilt Angle
- 40 43mrad
- 20 27mrad

Sensor
- S with sensor
- K no sensor

E.g.: P35.T40S, θxθy tilt motion, tilt angle to 43mrad,with sensor.

▸ Recommended Controllers

E00/E01	E53.B	E70
		
3 channels Digital, analog Open/closed loop Ave. current to 291mA	3 channels Digital, analog Open/closed loop Ave. current to 60mA	3 channels Digital, analog ontrol Open/closed loop Ave. current to 70mA

Note: Please see "Piezo Controller" for detailed information.

P35A Piezo Tip/Tilt Platform

▸ Characteristics

- θx, θy tilt
- Max tilt angle to 50mrad
- Closed-loop resolution to 2μrad

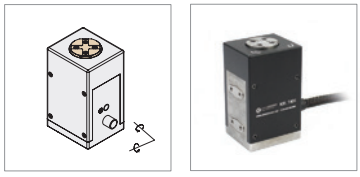
▸ Technical Data

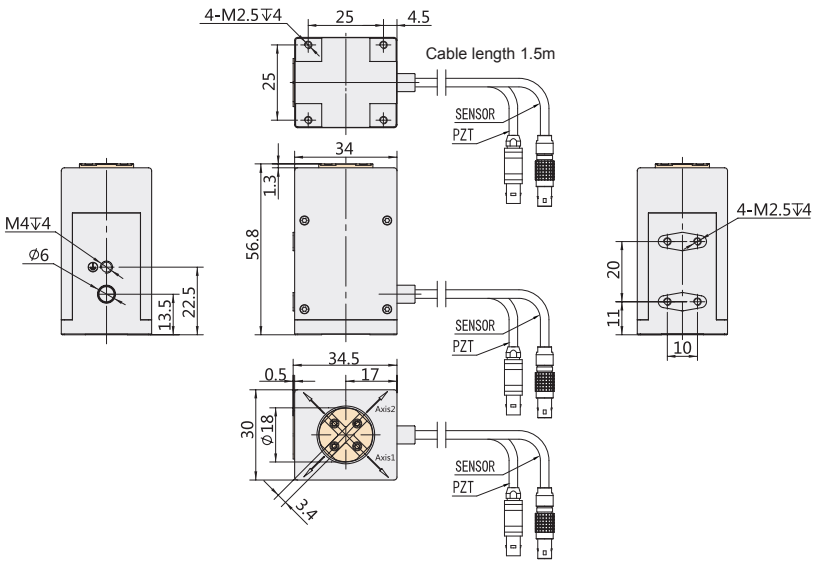
Type	S - closed loop K - open loop	P35A.T40S	P35A.T40K	Units
Active axis		θx, θy	θx, θy	
Tilt angle(0~120V)		40(≈8250″)	40(≈8250″)	mrad±10%
Tilt angle(0~150V)		50(≈10300″)	50(≈10300″)	mrad±10%
Integrated sensor		SGS	-	
Integrated resolution		2	1	μrad
Linearity		0.05	-	%F.S.
Repeatability		0.02	-	%F.S.
Unloaded resonant frequency		1300	1300	Hz±20%
Resonant frequency@12.7×3mm mirror		1050	1050	Hz±20%
Unload step time		1.4	1	ms±20%
El. capacitance		7.2	7.2	μF±20%
Material		Titanium	Titanium	
Mass		223	223	g±5%

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

▸ Drawing

P35A





S22 Piezo Tilt Platform

S22 Piezo Tilt Platform is a θx deflection platform. The flexible hinge guiding design has zero friction and static resistance, high guiding precision, nano-radian resolution and excellent positioning stability. With a beam deflection range of up to 6mrad, it has an extremely fast response speed (milliseconds to microseconds) and is ideal for dynamic operation (eg. tracking, scanning, drift and vibration cancellation) and positioning of optics and samples.

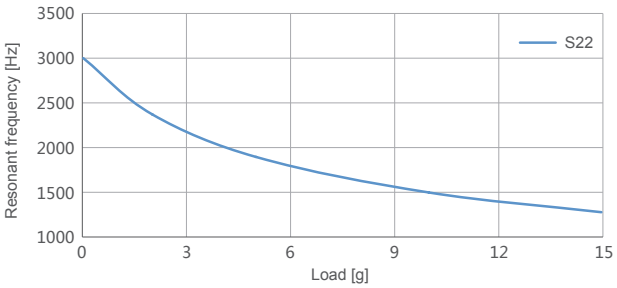
Characteristics

- θx tilt
- Tilt angle up to 3mrad
- Sub-ms response time
- High closed-loop positioning accuracy

Typical Application

- Image processing and stabilization
- Laser scanning
- Beam deflection
- Sample detection
- Interlaced scanning, jitter
- Optical filter/switch

Frequency and Load Curve



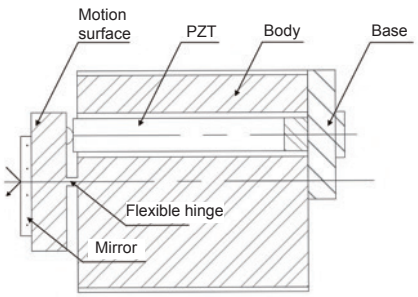
Technical Data

Type	S - closed loop K - open loop	S22.U3S S22.U3K	Units
Active axes		θx	
Tilt angle(0~120V)		2.5(≈520″)	mrad±10%
Tilt angle(0~150V)		3(≈610″)	mrad±10%
Integrated sensor		SGS/-	
Resolution		0.3/0.1(≈0.02″)	μrad
Closed-loop linearity		0.2/-	%F.S.
Closed-loop repeatability		0.15/-	%F.S.
Unloaded resonant frequency		3	kHz±20%
Unloaded step time		3/0.8	ms±20%
Unloaded operating frequency	10% travel	100	Hz±20%
	100% travel	40	
El. capacitance		1.8	μF±20%
Material		Steel	
Mass		80	g±5%

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

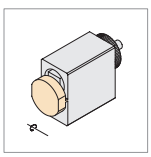
Driving Principle

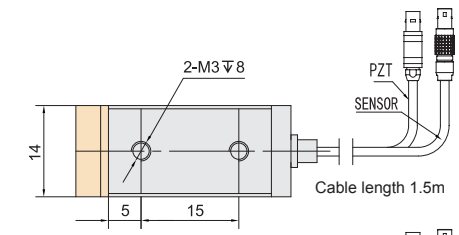
The platform is supported by one hinge and is pushed by a linear piezo actuator. The hinge defines the pivot point and serves to apply a preload to the piezoelectric actuator. The single hinge and single actuator design has the advantages of simple structure, small size, and high cost performance. If the operating environment temperature varies widely during angular deflection, it is recommended to use a differential drive piezoelectric deflection platform.

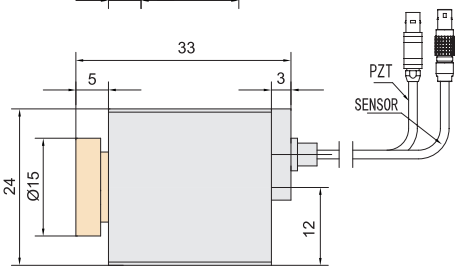


Drawing

S22







S23 Piezo Tip/Tilt Platform

S23 piezoelectric Tilt/Tip and Z Platform(phase shifter) is a θx, θy deflection/tilt and Z-axis linear motion platform, with a center aperture. The product is compact, and features the deflection range of 0.7mrad, Z-axis linear motion travel of 10μm. S23 is an open-loop version with high resolution and response speed, it is the first choice for interference scanning phase shift.

▸ Characteristics

- θx, θy tilt and Z linear motion
- Center aperture: Ø10mm
- High temperature stability
- Piezo phase shifter

▸ Typical Application

- Image processing and stabilization
- Laser scanning / beam deflection
- Active and adaptive optics
- Optical filter
- Phase shifter
- Beam stabilization

▸ Motion Control

S23 Platform/Phase Shifter has build-in three piezo actuators connected in parallel to provide the top ring motion. For vertical positioning (piston movement), it requires a controller with only one drive channel and three drive channels when it is in Z-direction and tip/tilt motion.

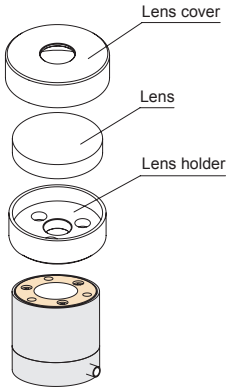
▸ Open Loop, High Dynamic, With Aperture

S23 piezo tip/tilt and Z platform/phase shifter is a multi-axis motion platform with the volume of only Ø20×19.5mm, can achieve 0.7mrad deflection in θx, θy and 12μm linear travel in Z. The open-loop version features ultra-high resolution and ultrafast response speed. The tripod structure design has an very wide operating temperature range.

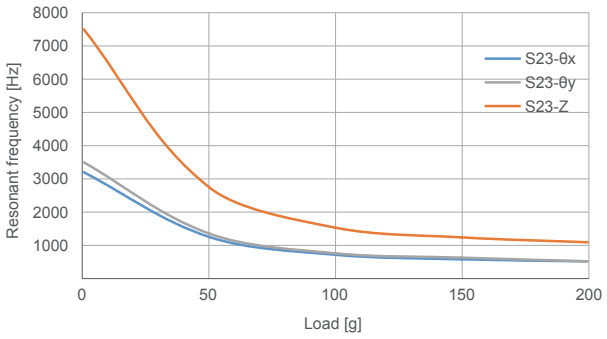
The center of the platform has a aperture of Ø10mm diameter, which is suitable for applications requiring light transmission, such as light filtration.

▸ Optional Mirror Adapter

S23 Piezo tilt/tip platform can be equipped with a mirror adapter to facilitate the installation of the lens.



▸ Frequency and Load Curve



▸ Recommended Controllers

E01	E53.A	E70
		
3 channels Digital, analog Open/closed loop Ave. current to 291mA	1 channel Analog input Open loop Ave. currrent to 60mA	3 channels Digital, analog Open/closed loop Ave. current to 70mA

Note: Please see "Piezo Controller" for detailed information.

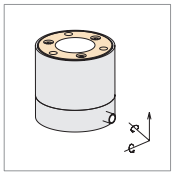
▸ Technical Data

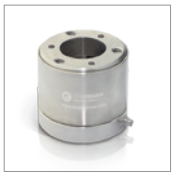
Type	K - openloop	S23.Z10K	S23.ZT1K	Units
Active axis		Z	θx, θy, Z	
θx, θy tilt angle(0~120V)		-	0.55(≈110″)	mrad±20%
Travel in Z(0~120V)		8	8	μm±20%
θx, θy tilt angle(0~150V)		-	0.7(≈140″)	mrad±20%
Travel in Z(0~150V)		10	10	μm±20%
Tilt resolution in θx, θy		-	0.02(<0.01″)	μrad
Resolution in Z		0.1	0.1	nm
Unloaded resonant frequency		7.5	θx3.2/θy3.5/Z7.5	kHz±20%
Unloaded step time		1.5	0.5	ms±20%
Unloaded operating frequency	10% travel	2000	1500	Hz±20%
	100% travel	200	150	
El. capacitance		0.5	0.5/axis	μF±20%
Material		Steel	Steel	
Mass		50	80	g±5%

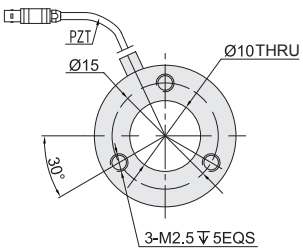
Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

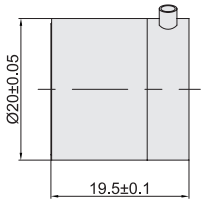
▸ Drawing

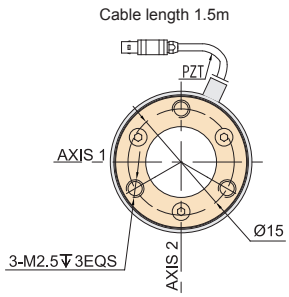
S23











S30 Piezo Tip/Tilt Platform

S30 is an open-loop θx, θy piezo tip/tilt platform, which is designed for highly-dynamic applications, with unloaded resonance frequency up to 15kHz.

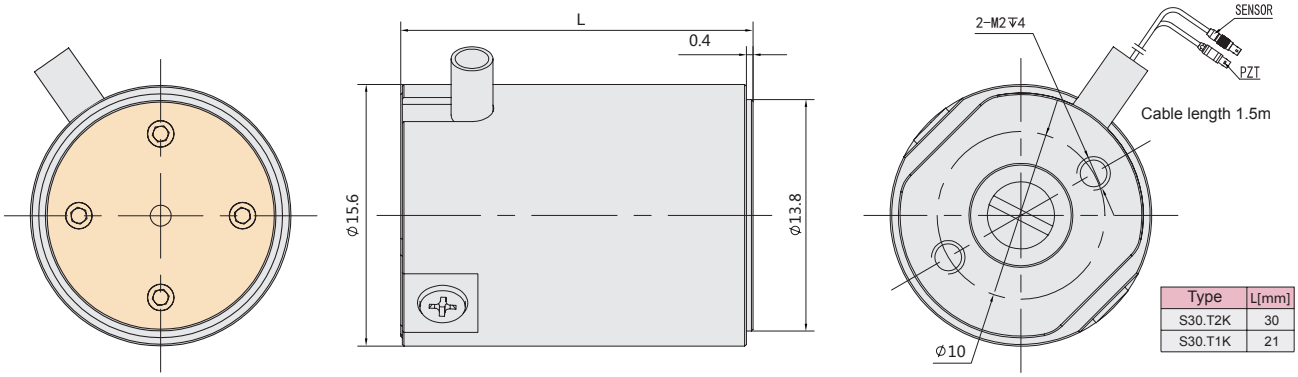
▸ Characteristics

• Small size • Nanoradian resolution • Unloaded resonant frequency: 15kHz • High-dynamic • Open-loop

▸ Technical Data

Type	S30.T2K	S30.T1K	Units
Active axes	θx, θy	θx, θy	
Tilt angle(0~120V)	3/±1.5	1.5/±0.75	mrad±10%
Integrated sensor	-	-	
Resolution	0.03	0.02	μrad±20%
Unloaded resonant frequency	15	15	kHz±20%
Resonant frequency @ loading Ø12.5×3mm mirror	10	10	kHz±20%
Distance from pivot point to platform surface	4.2	4.2	mm±0.2mm
El. capacitance	1.6/axis	0.7/axis	μF±10%
Material	Titanium, steel	Titanium, steel	
Mass	30	20	g±5%
Height(L)	30	21	mm
Driving channels	3, includes one constant voltage output		

▸ Drawing



Note: For closed-loop drawing, please refer to Coremorrow's official website or consult sales engineer.

S33 Piezo Tip/Tilt Platform

▸ Characteristics

• θx, θy tilt • Tilt angle: 1.5 or 3mrad • Small size, outer diameter is only 20mm • Optional closed-loop sensor

▸ Technical Data

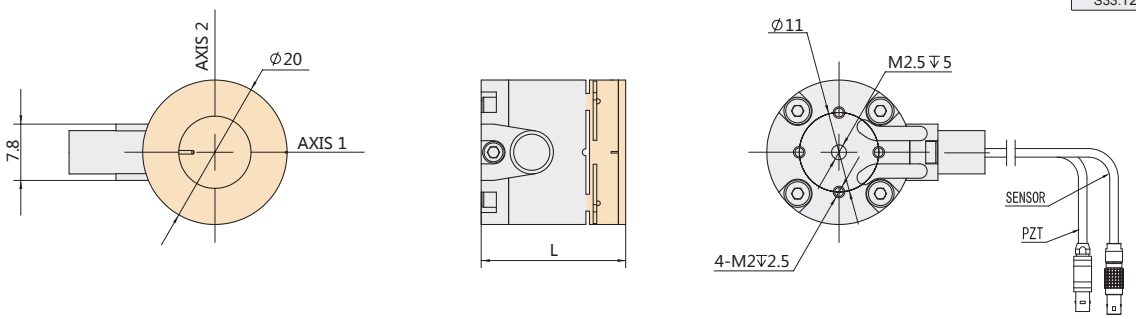
Type	S - closed loop K - open loop	S33.T1S S33.T1K	S33.T2S S33.T2K	Units
Active axes		θx, θy	θx, θy	
Tilt angle(0~120V)		1.2	2.4	mrad±20%
Tilt angle(0~150V)		1.5	3	mrad±20%
Integrated sensor		SGS/-	SGS/-	
Resolution		0.5/0.02	1/0.04	μrad
Closed-loop linearity		0.3/-	0.4/-	%F.S.
Closed-loop repeatability		0.1/-	0.2/-	%F.S.
Unloaded resonant frequency		7000	2000	Hz±20%
El. capacitance		1.6	3.6	μF/axis±20%
Material		Steel, cuprum	Steel, cuprum	
Mass(with no cable)		50	60	g±5%

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

▸ Drawing

Note: Only mouting at the base, clamping is not accepted.

Type	L[mm]
S33.T1	20
S33.T2	29



S34.T2S/KF Piezo Tip/Tilt Platform

※Selection Guide

S34. T 2 S F

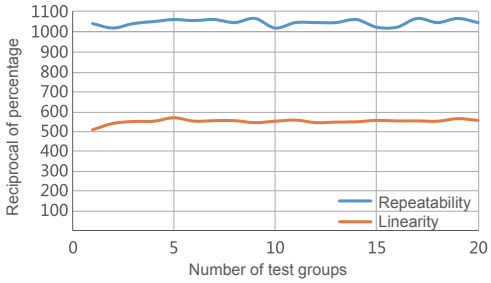
- Active axis
  - T θxθy
  - U θx
- Tilt angle
  - 2 2mrad
- Sensor
  - S with sensor
  - K no sensor
- Square edge fixed

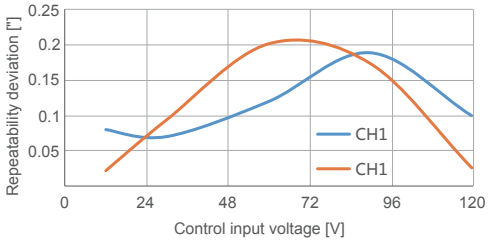
E.g.: S34.T2SF, θxθy tilt motion, tilt angle to 2mrad,with sensor

S34.T2S/KF features a deflection angle of up to 2.5mrad and can load Φ110×10mm len (approx. 245g). The response time to 0.2mrad deflection angle is about 2ms, and the operating frequency at a deflection angle of ±0.1mrad can reach 250Hz.

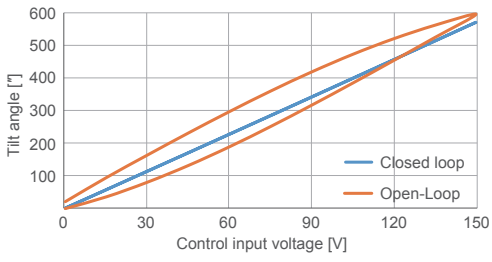
▸ Closed Loop Accuracy

Linearity ~0.2%F.S., and repeatability ~0.1%F.S.

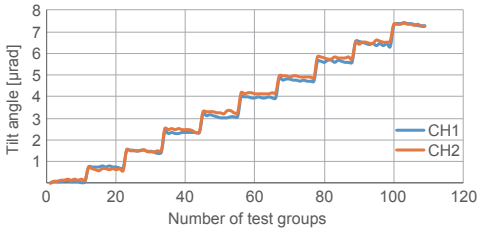




▸ Open/Closed-loop Curve



▸ Closed-loop Resolution<1μrad

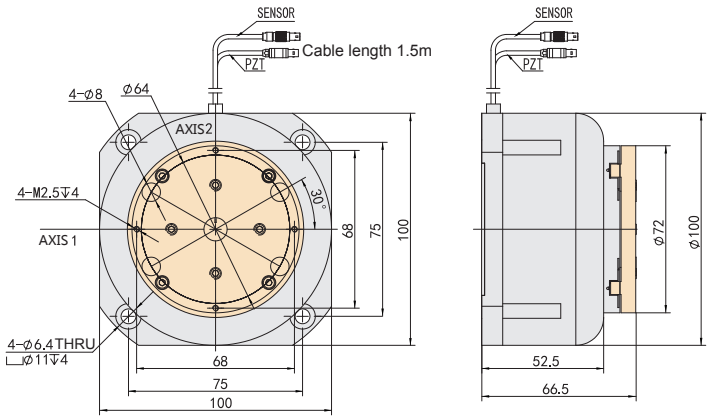


▸ Technical Data

Type	S - closed loop K - open loop	S34.T2SF S34.T2KF	Units
Active axes		θx, θy	
Tilt angle(0~120V)		2	mrad±10%, typ.
Tilt angle(0~150V)		2.5	mrad±10%, max
Integrated sensor		SGS/-	
Resolution		<1	μrad
Closed-loop linearity		0.2/-	%F.S.
Closed-loop repeatability		0.1/-	%F.S.
Unloaded resonant frequency		1700	Hz±20%
Loaded resonant frequency		740	Hz±20%@245g
Close-loop response		2 (0.2mrad anglar travel)	ms±20%
Operating frequency		250 (±0.1mrad anglar travel)	Hz±20%
El. capacitance		7.2	μF/axis±20%
Load capacity		245 (Φ110×10mm lens)	g
Material		Aluminum	
Mass		about 2	kg±20%
Cable length		1.5	m±10mm

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

▸ Drawing



S34.T2S/KY Piezo Tip/Tilt Platform

Characteristics

- θx, θy tilt
- Load capaciy to 500g
- High resonant frequency
- Fast response

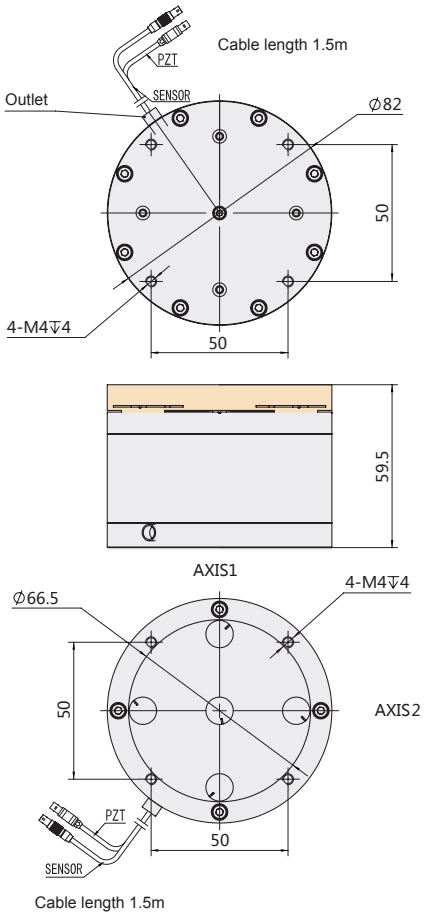
Technical Data

Type	S - closed loop K - open loop	S34.T2SY	S34.T2KY	Units
Active axes		θx, θy	θx, θy	
Tilt angle(0~120V)		0.8(≈165″)	0.8(≈165″)	mrad/axis±10%
Tilt angle(0~150V)		1(≈200″)	1(≈200″)	mrad/axis±10%
Integrated sensor		SGS	-	
Resolution		0.1	0.02	μrad
Linearity		0.5	-	%F.S.
Repeatability		0.2	-	%F.S.
Unloaded resonant frequency		2800	2800	Hz±20%
Resonant frequency@500g		600	600	Hz±20%
Step Time		5	3	ms±20%
El. capacitance		14.5	14.5	μF/axis±20%
Material		Steel, Aluminum	Steel, Aluminum	
Mass		2000	2000	g±5%

Note: Above parameters are measured with the E00/E01 piezo controller. The maximum driving voltage can be -20V~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

Drawing

S34.T2S/KY



S37 Anti-Vibration Piezo Tip/Tilt Platform

▸ Characteristics

- High reliability
- Anti-vibration design
- Optional open/closed loop
- Large deflection angle

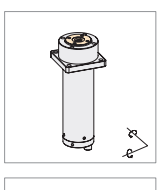
▸ Technical Data

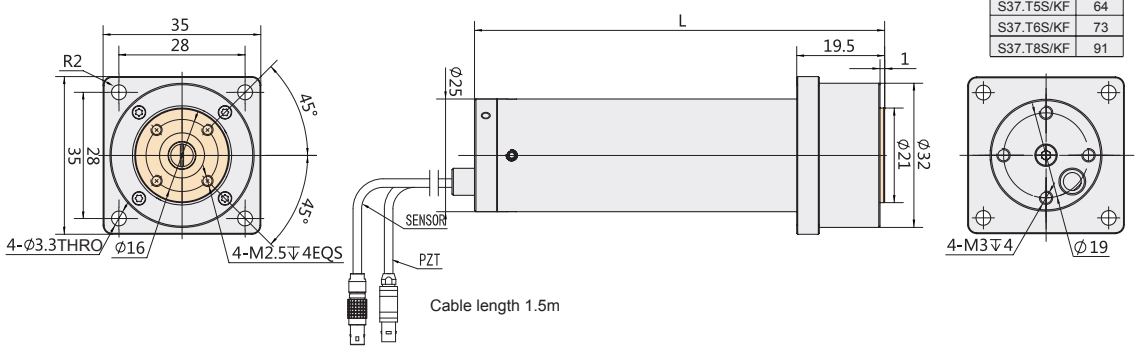
Type	S - closed loop K - open loop	S37.T2SF S37.T2KF	S37.T3SF S37.T3KF	S37.T4SF S37.T4KF	S37.T5SF S37.T5KF	S37.T6SF S37.T6KF	S37.T8SF S37.T8KF	Units
Active axis		θx, θy	θx, θy	θx, θy	θx, θy	θx, θy	θx, θy	
Tilt angle(0~120V)		2.5/±1.25	4/±2	5/±2.5	6.8/±3.4	7.5/±3.75	10/±5	mrad±20%
Tilt angle(0~150V)		3.5/±1.75	5.5/±2.75	6.8/±3.4	9.5/±4.75	10/±5	13.5/±6.75	mrad±20%
Integrated sensor		SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	SGS/-	
Resolution		0.25/0.1	0.4/0.15	0.5/0.25	0.65/0.3	0.75/0.35	1/0.5	μrad
Closed-loop linearity		0.2/-	0.2/-	0.2/-	0.17/-	0.17/-	0.17/-	%F.S.
Closed-loop repeatability		0.06/-	0.06/-	0.06/-	0.06/-	0.06/-	0.06/-	%F.S.
Unloaded resonant frequency		6.5	6.4	6.3	6.2	6.1	6	kHz±20%
El. capacitance		3.6	5.2	7.2	9	11	14.5	μF±20%
Material		Steel, titanium	Steel, titanium	Steel, titanium	Steel, titanium	Steel, titanium	Steel, titanium	
Mass		200	230	250	275	300	350	g±5%
Platform Length		37	46	55	64	73	91	mm±0.1

Note: The above parameters are measured using E00/E01 piezo controllers. The max driving voltage can be -20~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

▸ Drawing

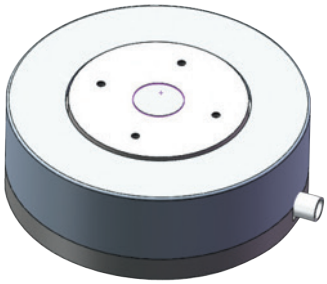
S37.xxS/KF





Type	L[mm]
S37.T2S/KF	37
S37.T3S/KF	46
S37.T4S/KF	55
S37.T5S/KF	64
S37.T6S/KF	73
S37.T8S/KF	91

Custom Tip/Tilt Platform



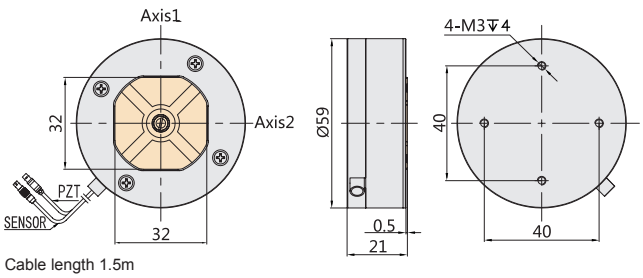
Characteristics

- θx, θy motion
- Deflection angle to ±0.25mrad/axis
- Optional closed-loop sensor
- Suitable for nutation motion

Technical Data

Type	Custom platfrom	Units
Active axes	θx, θy	
Tilt angle0~150V	±0.25/axis	mrad±20%
Working mode	Open /closed loop	
Unloaded resonant frequency	8000	Hz±20%
Load resonant frequency (Ø35×8mm mirror)	4500	Hz±20%
El. capacitance	1.6/axis	μF±20%
Operating frequency	2000(@±0.1mrad)	Hz±20%
	600(@±0.25mrad)	
Material	Itanium alloys	

Drawing



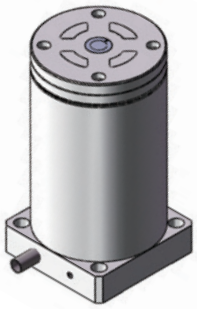
Cable length 1.5m

Recommended Controllers

E00/E01	E53.B	E70
		
3 channels Analog, digital Open /closed loop Ave. current 291mA	3 channels Analog control Open /closed loop Ave. current 60mA	3 channels Analog, digital Open /closed loop Ave. current 70mA

Note: Please see "Piezo Controller " for detailed parameters.

20072 Large-Load Tilt Platform



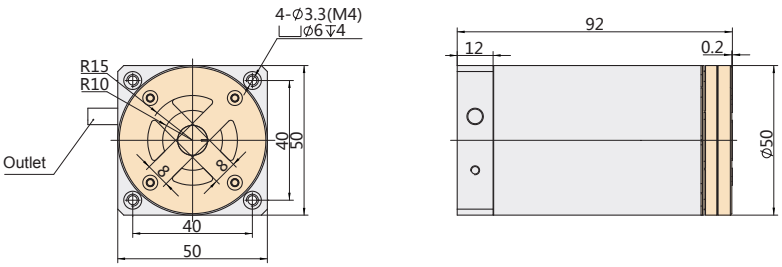
▸ Characteristics

- θx, θy motion
- Tilt angle to ±4mrad/axis
- Optional sensor
- For large load applications

▸ Technical Data

Type	20072	Units
Nominal travel range	±4/axis	mrad±20%
El. capacitance	28.8/axis	μF±20%
Resonant frequency@ Ø100×5mm mirror	≥300	Hz±20%

▸ Drawing



▸ Recommended Controllers

E00/E01	E53.B	E70
		
3 channels Analog, digital Open /closed loop Ave. current 291mA	3 channels Analog control Open /closed loop Ave. current 60mA	3 channels Analog, digital Open /closed loop Ave. current 70mA
Note: Please see "Piezo Controller " for detailed parameters.		

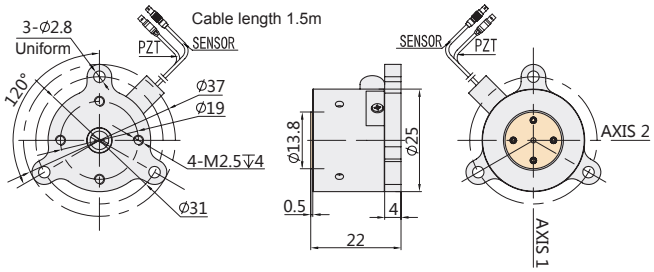
20193-1 High Frequency Fast Steering Mirror

▸ Technical Data

Type	20193-1	Units
Active axes	θx, θy	
Tilt angle(0~100V)	±0.5/axis	mrad±20%
Integrated sensor	SGS	
Unloaded resonant frequency	15	kHz±20%
Resonant frequency (@Ø12.7×3mm)	11.6	kHz±20%
El. capacitance	0.8/ axis	μF±20%
Material	Titanium, steel	
Mass	<60 (not include cable)	g±5%

▸ Drawing

20193-1



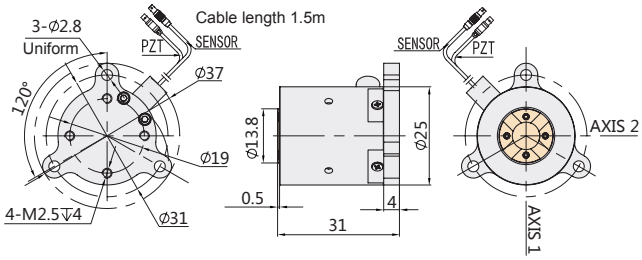
20193-2 Large-Angle Fast Steering Mirror

▸ Technical Data

Type	20193-2	Units
Active axes	θx, θy	
Tilt angle(0~100V)	±1.2/axis	mrad±20%
Integrated sensor	SGS	
Unloaded resonant frequency	10	kHz±20%
Resonant frequency (@Ø22×4mm)	4.2	kHz±20%
El. capacitance	1.6/axis	μF±20%
Material	Titanium, Steel	
Mass	70 (not include cable)	g±5%

▸ Drawing

20193-2



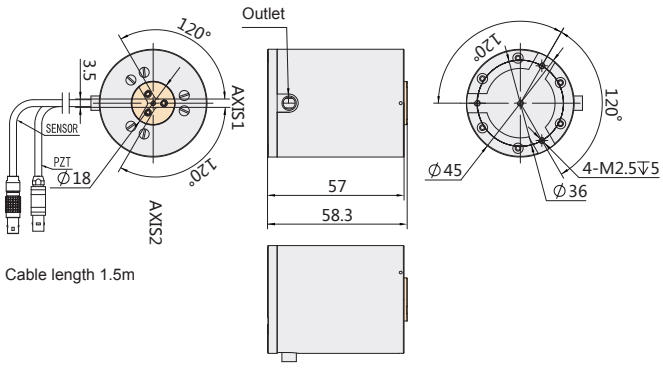
21019 Piezo Tip/Tilt Platform

▸ Technical Data

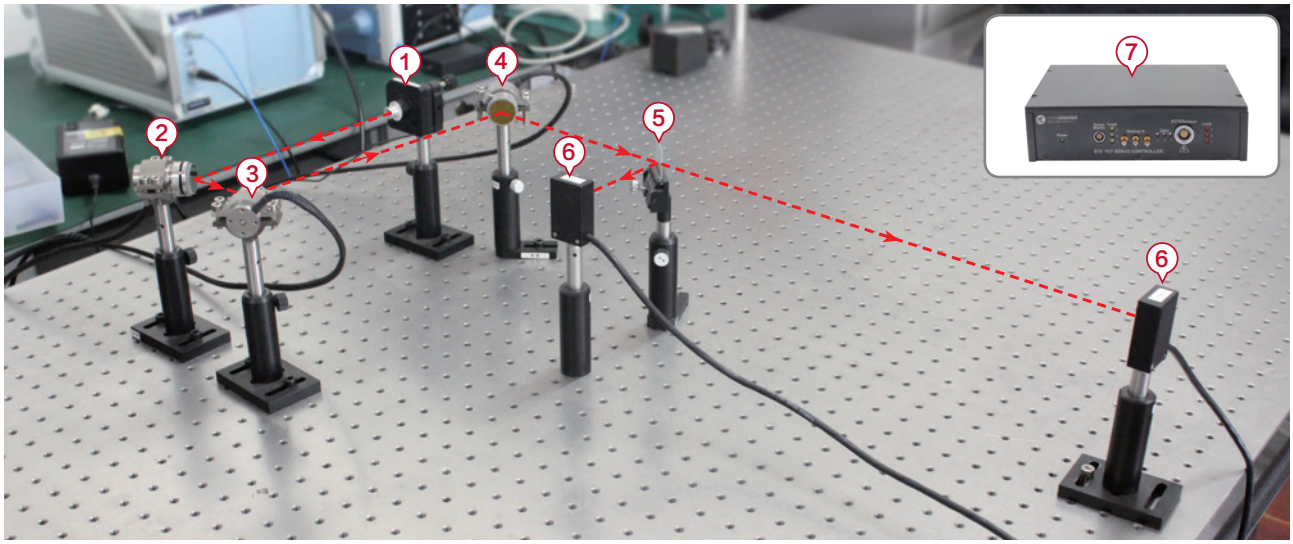
Type	21019	Units
Active axes	θx, θy, Z	
Tilt range (0~150V)	17/axis	mrad±20%
Z travel (0~150V)	200	μm±20%
Integrated sensor	SGS	
Unloaded resonant frequency	1	kHz±20%
El. capacitance	3.6/axis	μF±20%
Material	Aluminum, Steel	

▸ Drawing

20190



PSD Laser Stabilization System



This is a laser stabilization system built by CoreMorrow. We could provide the entire set of components of the system, and the structural principle, optical path, component model parameters, etc. according to the specific requirements of the user experiment.

▸ Introduction

① Laser, point light source

② P33.T2K FSM, θxθy 2-axis tilt jitter compensation, tilt angle to 3mrad/axis, drove by E70 piezo controller

③ P33.T2K FSM, θxθy 2-axis tilt jitter compensation, tilt angle to 3mrad/axis, drove by E70 piezo controller

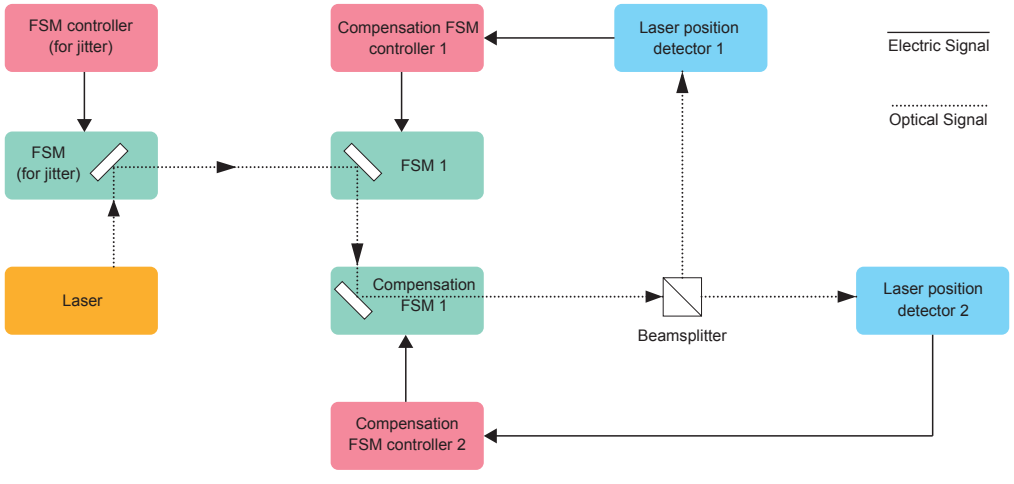
④ P33.T2K FSM, θxθy 2-axis tilt jitter compensation, tilt angle to 3mrad/axis, drove by E70 piezo controller

⑤ Beamsplitter

⑥ Laser position detector, detection of laser position

⑦ E70 piezo controller, driving P33.T2K FSM and processing the position signal feedbacked by laser position detector to form closed-loop control

▸ Principle



Challenge the Limits of Nano Motion and Control Technology...

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